Technical Documentation

NRI
A Crane Co. Company

Changer series
PROTEUS E-66/
currenza A-66
MDB

User manual

RoHS ✓

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ANNEX

1   GENERAL INFORMATION

This chapter should provide a general overview of the advantages and options regarding the changer E-66/A-66. However, the first section is designed to help you find your way through this manual with ease.

General information regarding this manual

This manual describes the design, operation and range of functions of the changer series E-66/A-66 with MDB data transfer protocol. Chapters 5, 6 and 7 explain the necessary steps for installing, starting up and operating the changer. Chapters 8 and 9 explain how to clean and transport the changer.

The appended chapters with side tabs "Index", "Function overview for setting module", and "Troubleshooting" reduce the search for specific explanations and extra help.

Text conventions

To make it easier for you to navigate within this manual and to operate the device, the following accentuations were made in the text:

⚠️ **Safety instructions, which have to be observed in order to protect operators and equipment.**

☞ *Special notes, which should facilitate the use of the changer.*

1 2 3.. Requests to perform an action are numbered in another typeface.

➡ At the beginning of a large chapter you will find a short "guide", which summarizes the content of the chapter.

🔧 Device functions, which are set or prepared by the manufacturer according to customer specifications and can be set or changed using the NRI configuration tools (see section "Configuration tools" in this chapter and Chap. 11 "Which functions can be set using the configuration tools?" as well as web pages for product accessories on the internet (www.nri24.com)).

Additional technical documentation

Apart from the manual you already have, there is further documentation for the E-66/A-66, e.g. about mounting dimensions, spare parts, testing, and configuration. All documentation is available in a compressed PDF format at www.nri24.com ($\rightarrow$ Download $\rightarrow$ Changer E-66/A-66 "Technical documentation").

General information regarding the changer

The 4-tube changers of the PROTEUS E-66/**currenza** A-66 series are designed to be used for vending and service machines with the serial MDB interface (MDB = **M**ulti **D**rop **B**us).

To meet the requirements of PC-based platforms the E-66/A-66 is optionally available with a USB or RS-232 interface (e.g. for ticket machines, self-serve transaction kiosks).

The integrated coin validator is based on the reliable sensor system and false coin rejection system of the already well-known coin validator G-40.4000 from the G-46 changer series.

To be able to react as quickly as possible to new false coins and to enable you to make your individual adjustments, the changer can be connected to a PC programming station which is made up of the configuration and diagnostics software "WinEMP" (including card reader and licence chip card) and an NRI tester for power supply of the changer. With the aid of the Palm-OS® applications "PalmE66/PalmA66" or with the G-55.0460 setting module, you can configure the changer directly on the vending machine, independently from the PC. This manual provides a brief description of the configuration tools and a list of the device functions that can be set on an individual basis (see section "Service tools" in this chapter and Chap. 11 "Which functions can be set using the configuration tools?").

Tokens that were not programmed by the manufacturer can be configured directly on the vending machine by inserting the tokens.

Advantages

- Reliable sensor system and optimum rejection of false coins due to the integrated, electronic coin validator E-66.4000/A-66.4000
- A coin validator which is easy to configure enables a fast reaction to changing market situations or new false coins
- Easy configuring with help from
  – the PC software "WinEMP" for the workshop
  – the Palm OS® application "PalmE66/PalmA66" or the setting module G-55.0460 directly on the vending machine
- Universal payout mechanism for different coin diameters and thicknesses
- Flexible payout combinations provided by simplified replacement of the tube cassette
- Faster service due to error diagnosis
- Splash-proof electronics
- Monitored coin run and controlled sorting guarantee an improved operating reliability and protection against manipulation
- Acceptance speed of 2 coins per second
- Teach mode to teach up to three different tokens
- Flash technology for uncomplicated and time-saving coin validator operating software updates

Service tools

In order to test the changer and adapt it to your individual needs, you can acquire the following service tools from NRI:

PC test station

If you only wish to check the functionality of your coin changer without making any adjustments, the NRI WinSPT test station is sufficient. The test station is composed of the following components:

- Test software "WinSPT",
- Tester G-19.0654 for simulation and to test the device functions,
- PC connecting cable,
- Connecting cable for recording the data exchange between master and slave,
- 24 V DC power pack and mains cable

For further information on the WinSPT test station please refer to our product accessory pages at www.nri24.com and the appropriate operating instructions.

Configuration tools

To be able to react as quickly as possible to new false coins, in the workshop or on site, and to enable you to make your individual adjustments, the changer can be connected to:

- WinEMP PC programming station
- Palm OS® application "PalmE66/PalmA66"
- Setting module G-55.0460

For further information on all configuration tools please refer to our product accessory pages at www.nri24.com and the appropriate operating instructions.

To find out which configuration tools you can use to make which settings, please see Chap. 11 "Which functions can be set using the configuration tools?“.

Update tools

The coin validator integrated in the changer is equipped with a microprocessor including a flash memory. This allows the coin validator firmware to be updated quickly and without complications. In order to load new firmware in the coin validator, you need one of the three following alternatives:

• WinFlash PC update station
• mobile Flash-Prommer G-55.0350
• Palm OS® application "PalmFlash"

For further information on all update tools please refer to our product accessory pages at www.nri24.com and the appropriate operating instructions.

2   SAFETY INSTRUCTIONS

Before operating the device for the first time, please read through this manual carefully at least once, and most importantly the safety instructions. This is to ensure you have understood the contents of this manual as well as how to operate the changer.

Proper use

The 4-tube changers of the E-66/A-66 series are designed to be used for vending and service machines with the serial MDB or a USB/RS-232 PC interface. Use the changer for this purpose only. Under no circumstances can the manufacturer be held liable for any damage or loss resulting from improper use of the device.

The changers have been constructed in compliance with the state of the art and the recognized safety regulations. Nevertheless this equipment can be a source of danger. Therefore please observe the following safety regulations.

Protecting yourself and equipment

The changer may only be connected by a qualified electrician.

Only use the changer according to proper use. Under no circumstances can the manufacturer be held liable for any damage or loss resulting from improper use of the device.

The changer PCBs are fitted with components that can be damaged by electrostatic discharge. Please observe the handling instructions for components exposed to the risk of electrostatic discharge.

Select the correct voltage for the changer (see label).

Never pull the connecting cable of the coin validator from the changer when a voltage is applied.

Pull the vending machine's mains plug before you install, clean or remove the changer.

Always transport the changer without any coins in it and in its original packaging. It is only in this way sufficiently protected. Never carry it by means of the cables.

Contact NRI if you want to alter the construction of the device to a greater extent than the modifications described in these instructions.

Keep water and other liquids away from the changer.

If the device is no longer required, please dispose of it correctly.

We reserve the right to make technical modifications to the device which are not covered by these instructions!

3   DESIGN

→ This chapter describes the general design of the changer and also the components of the coin validator and of the payout unit that are important for operating the device:

- Return lever, keyboard, pilot lights, interfaces, switching block, label
- Tube cassette, payout set, filling level sensors
- Connecting cables

Overview of the device

11
PC connecting cable

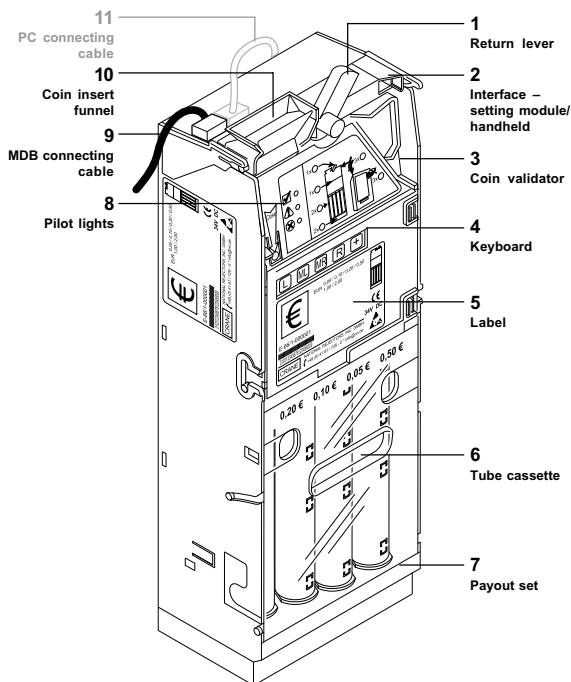**10**
Coin insert funnel

9
MDB connecting cable

8
Pilot lights

1
Return lever

2
Interface – setting module/ handheld

3
Coin validator

4
Keyboard

5
Label

6
Tube cassette

7
Payout set

Fig. 1a: Design

Coin validator

Coins inserted into the coin validator **3** pass through the coin insert funnel **10** into the measurement and validation area of the device, where their coin properties are compared with the values of the stored acceptance bands. Coins rejected by the coin validator pass into the return area of the vending machine, and coins accepted for a selling operation are either directed to the tube cassette **6** or to the cash-box. (See Fig. 1a)

Return lever

The return lever **1** on the top of the device is operated using the return button on the vending machine if the coins that have already been inserted are to be returned, or if a jam caused by, e.g., coins that have become stuck must be removed. When the return lever is operated, the measurement and validation area of the coin validator opens so that all objects within the coin validator are directed to the return area. (See Fig. 1a)

Keyboard

The front of the coin validator is equipped with five touch-sensitive keys **4** with which the payout unit's change tubes are filled, before the device is put into operation, and emptied for the inventory (see Fig. 1a as well as Chap. 7 "Operation").

Pilot lights

At the front of the coin validator there are also three light-emitting diodes (LEDs) positioned underneath one another **8** (green, yellow, red). These pilot lights are mainly used for fast diagnosis in case of malfunction but also as an indication of the current status in normal operation. If the green LED at the top lights up or flashes, there are no faults and the device is working properly. If the yellow light in the middle flashes there is a definite fault which, in general, can be easily remedied. If the red LED at the bottom flashes, it is probably a fault that must be remedied by a service technician. (See Fig. 1a as well as the appendix "Troubleshooting")
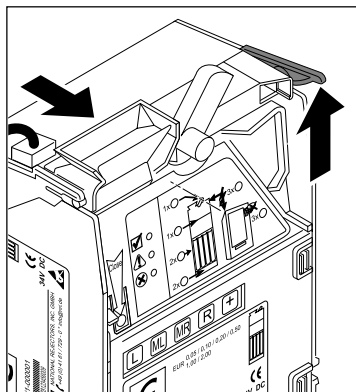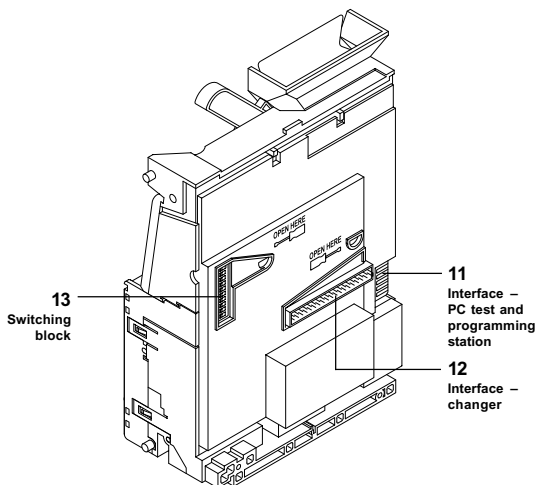
Fig. 1b: Dismounting the coin validator

13
Switching block

11
Interface – PC test and programming station

12
Interface – changer

Fig. 1c: Rear of the coin validator

Interfaces

On the rear of the coin validator in the middle, there is an interface **12**, by which the device can be connected to the changer using a ribbon cable (already assembled). On the front of the coin validator to the top right, there is a western modular plug **2** by which the changer can be connected to a Palm handheld or the setting module for configuration purposes. On the left side there is a PCB direct plug **11** which connects the validator to the PC programming and test station. (See Fig. 1a, 1b and 1c)

Switching block

Individual settings such as inhibiting various coin types can be made using the switching block **13** on the rear of the device (see Fig. 1b and 1c as well as Chap. 7 "Operation").

Label

The label of the coin validator contains all the data defining the device such as device type and series, as well as data programmed according to customer specifications, such as currency and coin types.
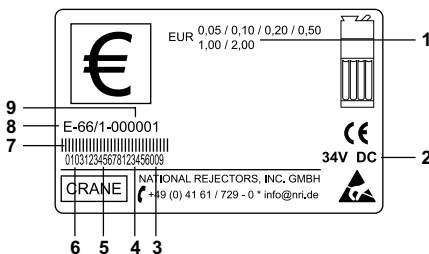
Fig. 2: Label of the changer

1 Currency and coin type

2 Nominal voltage of coin validator

3 Consecutive serial number per order number (3-digit)

4 Order number (6-digit)

5 Ordering code (8-digit)

6 Date of manufacture (4-digit)

7 Barcode

8 Device type

9 Data block number

Payout unit

The payout unit consists of the tube cassette and a payout set. To monitor the tube cassette, the device is equipped with filling level sensors and tube counters.

Tube cassette

The tube cassette **1** incorporates four change tubes **2–5** with different diameters for collecting up to four different coin types, which can be paid out to the customer (see Fig. 3). Which tube can collect which coin type, is identified by the sticker at the top of the tube cassette. The storage capacity for tube coins depends on the thickness of the coin type (guideline: approx. 62 times 0.50 euro coins per tube).

The coin validator checks whether an accepted coin – depending on the programming in each case – is to be sorted into one of the four tubes or directed into the cash-box.

If at any time you require another combination of tube coins, e.g. several tubes for the same coin type in order to achieve a larger change capacity, the appropriate cassette can be ordered from NRI and simply be exchanged (see Fig. 3).

☞ *However, if you change the tube combination, you must use the configuration tools to adapt the configuration of the coin validator (see Chap. 11).*

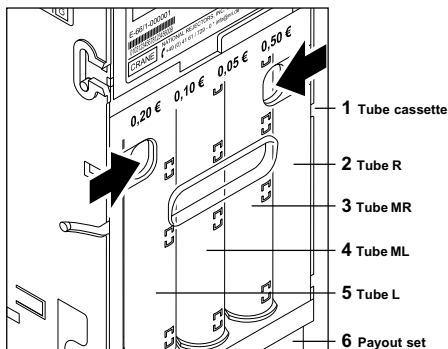**Fig. 3:** Removing/replacing the tube cassette

- **1** Tube cassette
- **2** Tube R
- **3** Tube MR
- **4** Tube ML
- **5** Tube L
- **6** Payout set

Payout set

Paying out of change is done by means of two motors installed in the bottom of the payout set **6**, which turn in order to pay out coins. The left-hand motor is responsible for the "left (L)" **5** and "middle left (ML)" **4** tubes and the right-hand motor is responsible for the "right (R)" **2** and "middle right (MR)" **3** tubes. (See Fig. 3)

Filling level sensors

Independent from the number of coins, the filling level of each tube is monitored by four sensors:

- Empty sensor positioned to the height of 8 to 10 collected coins
- 50% sensor
- 75% sensor
- Full sensor positioned at the top rim of the tube

In order that the tube counters function without fault, not only when the change tubes are filled by inserting coins into the changer (whereby the tube counters count them in), but also when the tubes are filled by removing the tube cassette, the filling level sensors check the tube counter status for plausibility after every coin acceptance and coin pay out. If the number of coins does not correspond with the measured filling level, the tube counter will be corrected depending on the respective coin thickness.

If the full sensor of a tube signals "tube full", all further coins for this tube will temporarily be directed to the cash-box. Only when coins have been paid out of this tube, coins are again sorted into this tube.

Connecting cables

The connecting cables are permanently installed on the top left-hand side of the changer.

- MDB connecting cable **10** to the vending machine/for PC application to the periphery
- USB/RS-232 connecting cable **11** to the PC-based vending machine/platform + feeder (barrel connector) (optional)

For details on how to install and connect the changer in the vending machine, see Chap. 5 "Installation".

4 FUNCTIONS

⟹   This chapter describes the functions of the changer:

• Filling and emptying tube cassette
• Considering the maximum coin number configured for the change tubes
• Considering the configured security stock of tube coins
• Inhibiting of specific coin types
• Disabling of the inventory keys
• Teach mode for tokens
• Communication with hoppers/recyclers
• Mains operation or battery operation?
• Telephone code
• Main currency and second currency (optional)
• Protection against string manipulation (optional)
• Tube counter functions

In this chapter the functions will only be described. To find out how to change adjustable functions, refer to Chap. 7 "Operation" regarding settings made directly on the changer, and refer to the separate instructions regarding settings made using the configuration tools (cp. also Chap. 11 "Which functions can be set using the configuration tools?").

Filling and emptying the tube cassette

The simplest and quickest way to fill and empty the tube cassette, is to remove the cassette (see Fig. 4) therefore allowing you to sort or respectively remove several coins at once.
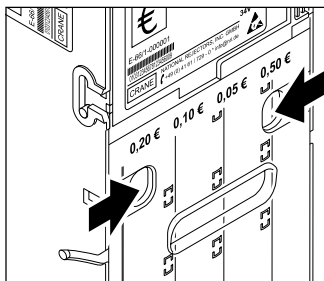

Fig. 4: Folding out the tube cassette

Coins are paid out individually, e.g. for test purposes, or one after another for an inventory or before transportation of the device.

If the correct number of tube coins is needed to simplify management and audit of coins, the change tubes are filled by inserting single coins into the coin changer or emptied by pressing a key, when the cassette is installed. Activated by the keyboard, the tube counters register every coin inserted or paid out (see Chap. 6 "Start-up" and Chap. 7 "Operation").

In this way the tube cassette can also be filled and emptied with the help of the PC software, the Palm OS® application or the setting module (see Chap. 11 "Which functions can be set using the configuration tools?").

The changer offers two functions, which simplify the filling process, when the tube cassette is inserted:

- Acceleration of coin acceptance and coin sorting: The changer can temporarily be set so that the accepted coin sensor indicating manipulation attempts is ignored. This setting is not suitable for normal operation, but only for filling the tube cassette.

- Inhibiting of cash-box coins: The changer can be set so that only tube coins are accepted when filling the tubes.

Filling/Emptying the change tubes at a certain filling level (float level) ...

Should you wish the service personal to always fill or empty the tubes at a filling level of a certain and always identical coin number, a so-called float level can be configured for every tube, which determines this coin number.

This filling level is irrelevant for normal operation and only guarantees that for accounting purposes a known number of coins can be presumed.

... with the tube cassette inserted

If the tubes are filled on site by inserting single coins, you must additionally activate the float up function, so that cash-box coins will not be accepted and the cash-box will not need to be emptied before filling the tubes, as cash-box coins are rejected in this case.

... with the tube cassette dismounted (replacement cassette)

If the tubes are not filled on site but beforehand, so that the empty cassette must only be replaced with the already filled replacement cassette on site, you must additionally activate the function of the automatic tube counter programming, so that the tube counters are set to the float level coin number automatically in tube filling level mode, as soon as the tube cassette is removed from the changer.

How many coins, at most, are to be sorted into the change tubes?

🔧 The changer can be configured so that each change tube accepts no more than a specific number of coins.

When this number of coins is reached in a tube, all further coins for this tube are then directed into the cash-box temporarily. Only when coins have been paid out of this tube, coins are again sorted into the tube.

If this function is not used, the upper filling level sensor (full sensor) of the tubes determines, irrespective of the number of coins, from when the coins will be sorted into the cash-box and no longer into the tubes.

How many coins, at least, are supposed to cover the tube bottom (security stock)?

🔧 If a security stock is configured for the individual change tubes, the changer does not pay out a minimum number of tube coins.

For coins that cause problems during stacking and tend to stand upright instead of lying flat, a relatively high setting for the security stock should be selected since the coins will no longer spring back and stand upright when they fall onto a higher stack of coins.

🔧 The changer can also be set so that the configured security stock can be paid out by the vending machine and the security stock can also be transmitted to the vending machine whenever the machine scans the tube filling level.

Inhibition of specific coins/activation of narrow acceptance bands

If you want a specific (e.g. false money-prone) coin to either be accepted only in the narrow or very narrow acceptance band or be no longer accepted at all for payment at the vending machine, you can inhibit either its normal acceptance band or the complete acceptance also using the switching block on the rear of the coin validator (see Chap. 7 "Operation").

Disabling of inventory keys

The inventory keys are part of the keyboard of the changer: keys L, ML, MR, R. These keys allow the paying out of one, several or all coins from the corresponding change tube L, ML, MR, R.

Should these keys no longer be operated, they can be generally disabled, or in such a way that they can be enabled by means of the vending machine control system.

Teach mode for tokens

The changer has three memory locations (coin channels) for configuring a maximum of three tokens. The measured values of a token can thus be newly assigned to a coin channel directly on the vending machine by inserting the corresponding tokens. The acceptance band generated then accepts these tokens as payment in the vending machine.

In addition, you can choose between a normal and wide acceptance band for the configured tokens. However, a wide acceptance band should only be set if a limited number of the tokens are available for generating the token measurement values, or if the tokens show very large tolerance values. Otherwise there is the danger that too many false coins will be accepted.

Tokens can either be configured so that the customer receives his goods for free (free vend tokens) or so that a specific value is assigned to the tokens (value tokens). The changer can direct accepted tokens either into the cash-box or into the return area and back to the customer.

Communication with hoppers

If a coin type is frequently paid out as change, and the respective tube is often empty, up to two hoppers (coin storage) can be connected to the changer from which the vending machine can pay out coins on an alternative basis.

In the changer, a setting must be made that one hopper or two hoppers are connected and which coin is being collected in the hopper so that the changer can decide which residual credit can no longer be paid out by the changer and must be paid out from the hoppers.

You can connect either hoppers or recyclers, but never the both simultaneously (see section "Communication with recyclers" in this chapter).

Communication with recyclers

Up to two recyclers (bill payout unit) can be connected to the changer, which can, together with a bill validator, accept and change bills.

In the changer, a setting must be made that one recycler or two recyclers are connected and which bill is being collected in the recycler, so that the changer can calculate and inform the vending machine, which residual credit can no longer be paid out by the changer and must be paid out from the recyclers.

In addition, you can inhibit high-value banknotes, when not enough change is available and the machine display signals "Tube empty".

You can connect either recyclers or hoppers, but never the both simultaneously (see section "Communication with hoppers" in this chapter).

Mains operation or battery operation? (not for USB/RS-232 interface)

MDB changers, which are equipped with a battery module and a wake-up line, can be used in the mains mode of operation or for mains-independent field work in the battery mode of operation. The desired operating mode can be easily selected using two switches on the changer's PCB (see Chap. 7 "Operation").

If battery operation is set, the vending machine wakes up the changer via an external wake-up line.

> How long the changer is to remain switched on after the last time the vending machine activated the changer (wake-up time) can be set on an individual basis.

After the wake-up time has elapsed, the changer switches off automatically and must be "woken up" again by the activation of the external wake-up line via the machine control system.

Telephone code

> Depending on the country the machine is installed in, a telephone code can be set on the changer and be transmitted to the vending machine control system, for example, for menu and other display texts.

Main currency and second currency (optional)

> Should you wish the changer to accept two currencies, the second currency can be converted into the main currency according to an adjustable rate.

The second currency is then rounded up or down so that it can be data-managed with the main currency.

Protection against string manipulation (optional)

The changer can be equipped with a string sensor on an optional basis. This string sensor detects coins inserted into the device on a string and then inhibits the coins from being accepted. By this security measure these coins will not generate any credit.

The sensitivity of the string sensor can be individually set. Following a case of attempted string manipulation, it is possible to ensure that the tube coins of the next 100 coins inserted are not sorted into the change tubes but are redirected into the cash-box instead.

"String coins" sorted into the cash-box are more reliably detected by the string sensor, so that any further attempts of manipulation would probably fail.

Tube counters

The four tube counters monitor the exact coin number in the tubes and register each coin accepted in the tubes and each coin given out off the tubes.

Automatic correction of tube counters

Usually after every coin acceptance and pay out, the coin changer compares the tube counter status and the measured filling level of the sensors and, if necessary, corrects the tube counter.

If the vending machine control is unable to process the automatic correction of the tube counters, the coin changer can be set so that the tube counters will not be corrected.

In this case, the change tubes should be filled by inserting the coins into the coin changer and not by placing the coins directly into the tube cassette (see Chap. 6 "Start-up" or Chap. 7 "Operation").

Automatic programming of tube counters

If the tube cassette is not refilled on site, but beforehand, and the already filled replacement cassette is only exchanged on site, you can activate the tube counter programming function, which sets the tube counters to the float level coin number automatically in tube filling level mode, as soon as the tube cassette has been removed from the changer.

Reset of tube counters

After the change tubes have been emptied, e.g., for repairs, the tube counters of those changers, in which the automatic tube counter correction is switched off, should be reset for the renewed start-up operation so that, when the tubes are being filled, the tube counter begins to count from zero and not from the stored number of coins.

5 INSTALLATION

⚠ **To avoid damage to the equipment, please make sure that you check the following before installation:**
   – that the MDB/PC connecting cable of the changer is suitable for machine interface,
   – that the supply voltage for the changer is the same as the nominal voltage on its label.

☞ *To enable the changer to communicate with a PC-based platform, we recommend to implement the comfortable NRI PaymentManager or the NRI USB program library as well as the NRI PC MDB protocol in the PC system (see separate instructions).*

How to install the changer in the vending machine:

1 Pull the vending machine's mains plug.
2 Hang the changer in the vending machine using the three mounting holes on the back wall (two at the top **1** and one at the bottom) (see Fig. 5a).
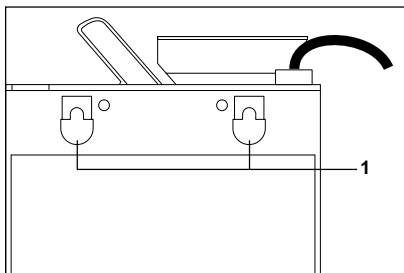
Fig. 5a: Hanging the changer in the vending machine
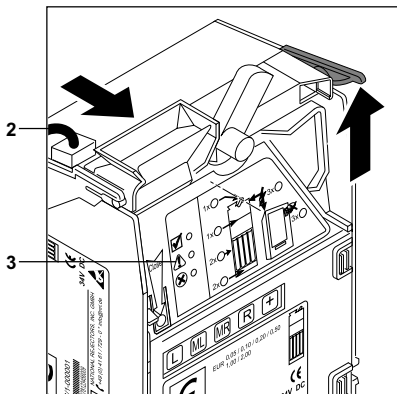
Fig. 5b: Folding out the coin validator

3 Fold out the coin validator (see Fig. 5b).

⚠ **Make sure that the coin validator is safely connected to the changer with the ribbon cable.**

4 Screw the housing of the changer tightly inside the vending machine.

5 Put the coin validator back in and engage.

⚠ **Make sure that there is an air space between the return lever of the vending machine and that of the changer.**

6 Connect the changer to the vending machine using the MDB/PC connecting cable **2** (see Fig. 5b) and also connect any external devices, such as hopper or recycler, to the changer.

7 If necessary, connect the changer to power using the feeder (barrel connector) for PC application.

8 Reconnect the vending machine to the mains supply. The three LEDs **3** on the coin validator light up briefly to test their function. Afterwards, the green LED lights up. The changer is operational (see Fig. 5b).

6   START-UP

Since the individual functions of the changer are programmed by the manufacturer according to customer-specific requirements, you only need to fill the four change tubes of the tube cassette with the respective coin types when starting up the device for the first time.

Filling the change tubes ...

Before the device is started up for the first time, the four change tubes must be filled either with the tube cassette inserted or dismounted.

... with the tube cassette inserted

If the tube cassette is installed in the changer, when filling the tubes for the first time, filling is done using the keyboard on the coin validator and by inserting coins of the respective tube coin.

☞ *In many cases, the vending machine control system also offers a filling function. In that case, this filling function should be used, due to the fact that the control unit may not be able to accept the filling level of the changer.*

If the cash-box is not empty, it must be emptied now, because the coins directed to the cash-box will not be counted.

☞ *The cash-box does not need to be emptied, if the changer has been set so that only coins to be sorted into tubes are accepted when the tubes are being filled or that the float up function is activated, which also inhibits the cash-box coins.*

1 Press the $\boxed{+}$-key.
   An acoustic signal and the flashing of the green LED show that the changer is no longer in operating mode, but in tube filling level mode.
2 Insert tube coins.
   The respective tube counter counts the accepted coins, and the changer sorts the respective coin type into its configured tube: either until
   – the full sensor is covered,
   – the configured max. number of coins is reached, or
   – the float level is reached.

Afterwards, the tube coins inserted will, depending on each setting, either no longer be accepted and directed into the return area, or they will be accepted and directed into the cash-box.

☞ *When inserting the first coin into each tube, make sure the coin lies flat inside the tube (see also section "How many coins, at least, are supposed to cover the tube bottom (security stock)?" in Chap. 4 "Functions").*

If all tubes are full:

3 Press the ⊞-key again.

Two acoustic signals and the green LED lighting up show that the changer is no longer in filling level mode, but back in operating mode.

☞ *If no coins are inserted in a 30-second time period, the changer returns to operating mode, without the ⊞-key being pressed again.*

... with the tube cassette dismounted

If the tube cassette is filled before inserting it in the changer:

⚠ **If you need an exact coin number for the audit, the changer must be configured for this filling method:**
   • **Float level (= coin number, that is in the tube after the filling process)**
   • **Activating the automatic programming of the tube counters to the float levels when inserting the cassette**
   • **Deactivating the automatic tube counter correction according to the filling level sensors**

1 Press ⊞-key.

An acoustic signal and the flashing of the green LED show that the changer is no longer in operating mode but in tube filling level mode.

2 (Remove empty tube cassette and) insert the prefilled cassette.

The four tube counters are set to the float levels' coin number.

3 Press ⊞-key again.

Two acoustic signals and the green LED lighting up show that the changer is no longer in filling level mode, but back in operating mode.

Performing individual settings

This section describes settings that can, but do not need to, be made for the initial start-up.

Configure changer on an individual basis

Since the most important functions of the changer are programmed by the manufacturer according to customer-specific requirements, it may only be necessary to perform individual settings.

All device settings can be set using the PC configuration software WinEMP or, more easily, using the Palm OS® application PalmE66/ PalmA66 or the setting module directly on site. To find out how to perform the settings, please refer to the respective separate instructions (see also Chap. 11 "Which functions can be set using the configuration tools?").

Select mains operation or battery operation (not for USB/RS-232 interface)

With MDB changers equipped with a battery module and a wake-up line, you can – depending on the installation location – always use the switches on the PCB to choose between mains operation and battery operation (see Chap. 7 "Operation").

7   OPERATION

➡️   In this chapter you will see how to carry out functions and settings, directly on the changer using the operating elements (the keyboard and switching block), rather than with additional tools.

Returning change or emptying tubes using the keyboard

Coins can be paid out from the change tubes either individually, if you need to test the coin acceptance, or one after another, when the tubes need to be emptied e.g. before transport, for repairs, or in case of an inventory.

The internal keys L, ML, MR and R apply to the tubes "**l**eft", "**m**iddle **l**eft", "**m**iddle **r**ight" und "**r**ight".

☞   *If the changer is configured in such a way that the inventory keys are disabled, the keys cannot be used. Either the device is set up in such a way that the keyboard can be enabled using the vending machine control system, or the keyboard must first be activated using a configuration tool (see Chap. 11 "Which functions can be set using the configuration tools?").*

To give out tube coins individually, simply press the corresponding key. One coin will be given out each time the key is pressed.

To pay out several tube coins:

1 Hold down the corresponding key L, ML, MR or R for approx. five seconds.
   The tube will be automatically emptied, without having to press the key again.
2 Press any other key.
   The coins will stop being paid out.

Emptying the change tubes up to a certain filling level using the keyboard

If a float level is configured, the change tubes can be emptied up to the tube counter status of the float level.

☞ *If the changer is configured in such a way that the inventory keys are disabled, the keys cannot be used. Either the device is set up in such a way that the keyboard can be enabled using the vending machine control system, or the keyboard must first be activated using a configuration tool (see Chap. 11 "Which functions can be set using the configuration tools?").*

Emptying the change tubes up to the float level:

1 Press the ⊞-key.
An acoustic signal and the flashing of the green LED show that the coin changer is no longer in operating mode, but in filling level mode.

2 Hold down any key Ⓛ, ⓂⓁ, ⓂⓇ or Ⓡ for approx. five seconds (green LED lights up).
All tubes will automatically be emptied up to the configured float level. Afterwards, two acoustic signals and the green LED lighting up show that the coin changer is no longer in filling level mode, but back in operating mode.

Refilling change by inserting coins

In order to provide the changer with change, the keyboard on the coin validator can be used to activate a tube filling level mode in which the change is filled up by inserting individual coins into the changer.

☞ *In many cases, the vending machine control system also offers a filling function. In that case, this filling function should be used, due to the fact that the control unit may not be able to accept the filling level of the changer.*

☞ *If the tubes were not emptied previously using the inventory keys and the automatic tube counter correction is switched off, it could be that the tube counters are not set to zero but to the number of coins stored prior to the emptying operation. In that case, the tube counters must be reset prior to the filling operation (see Chap. 11 "Which functions can be set using the configuration tools?").*

If the cash-box is not empty, it must be emptied now, because the coins directed to the cash-box will not be counted.

☞ *The cash-box does not need to be emptied, if the changer has been set so that only coins to be sorted into tubes are accepted when the tubes are being filled or the foat up function is activated, which also inhibits the cash-box coins.*

1 Press the $\boxed{+}$-key.
An acoustic signal and the flashing of the green LED show that the changer is no longer in operating mode, but in tube filling level mode.

2 Insert tube coins.
The respective tube counter counts the accepted coins, and the changer sorts the respective coin type into its configured tube: either until
– the full sensor is covered,
– the configured max. number of coins is reached, or
– the float level is reached.

Afterwards, the tube coins inserted will, depending on each setting, either no longer be accepted and directed into the return area, or they will be accepted and directed into the cash-box.

☞ *When inserting the first coin into each tube, make sure the coin lies flat inside the tube (see also section "How many coins, at least, are supposed to cover the tube bottom (security stock)?" in Chap. 4 "Functions").*

If all tubes are full:

3 Press the $\boxed{+}$-key again.
Two acoustic signals and the green LED lighting up show that
the changer is no longer in filling level mode, but back in
operating mode.

☞ *If no coins are inserted in a 30-second time period, the
changer returns to operating mode, without the $\boxed{+}$-key
being pressed again.*

Refilling change in replacement cassette and exchange it

You can also refill a replacement tube cassette up to a certain coin
number as a run-up, and only exchange this tube for the old one on
site. For audit purposes, this filling level per tube (float level) must
then be set and the automatic tube counter programming must be
activated, so that the tube counters are set to the float level
automatically.

☞ *In order to prevent the tube counters from being corrected
according to the filling level sensors, the automatic tube
counter correction must be switched off.*

1 Press $\boxed{+}$-key.
An acoustic signal and the flashing of the green LED show that
the changer is no longer in operating mode, but in tube filling
level mode.

2 Remove tube cassette and install refilled replacement
cassette.
The four tube counters are set to the float level coin number.

3 Press $\boxed{+}$-key again.
Two acoustic signals and the green LED lighting up show that
the changer is no longer in filling level mode, but back in
operating mode.

Inhibiting coins/activating narrow acceptance band

Using the first eight DIL switches of the switching block on the rear of the coin validator, you can inhibit the coin types configured on the first eight memory slots (coin channels 1–8) of the changer without using any additional configuration tools. Which coin type was programmed in which coin channel you will find out when contacting NRI or connecting WinEMP or PalmE66/PalmA66 (see Chap. 11 "Which functions can be set using the configuration tools?").

To activate a narrow coin channel the normal coin channel must be inhibited. If both channels are enabled, the wider acceptance band of the normal coin channel is used.

To inhibit a coin channel:

1 Fold the coin validator out of the changer (see Fig. 7a).
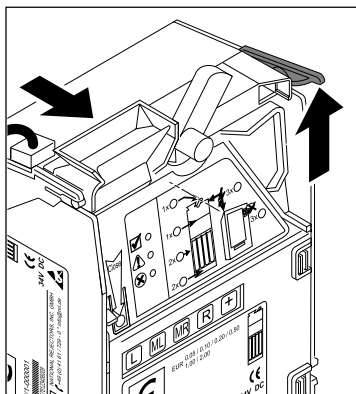
Fig. 7a: Folding out the coin validator

⚠️ **Make sure that the coin validator is safely connected to the changer with the ribbon cable.**

2 Use a pointed object to push the respective DIL switch
  (1 to 8) toward the right-hand side to ON (e.g. DIL
  switch 4 for inhibiting coin channel 4, see Fig. 7b).
  The coin channel assigned to this switch will no longer
  be used for acceptance of coins.

☞   *If a normal coin channel and a narrow coin channel
         have been programmed on the coin validator for
         one coin type, the normal coin channel must be
         inhibited as described above in order to activate
         the narrow coin channel. If both
         channels are activated, the wider*   **Fig. 7b:** Inhibiting coin
         *acceptance band of the normal coin
         channel is used.
         If the coin type is to be inhibited, both coin channels must be
         inhibited.*
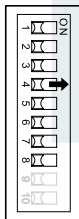
3 Put the coin validator back in and engage.

☞   *With the aid of the configuration tools, you have the
         possibility to inhibit all programmed coin types (see
         Chap. 11 "Which functions can be set using the
         configuration tools?").*

Select mains operation or battery operation (not for USB/RS-232 interface)

With changers equipped with a battery and a wake-up line, you can – depending on the installation location – always use the two DIL switches on the PCB to choose between mains operation and battery operation:

1 Fold the coin validator out of the changer (see Fig. 7a).

⚠ **Make sure that the coin validator is safely connected to the changer with the ribbon cable.**

2 For standard mains operation, use a pointed object to push the two DIL switches on the bottom right-hand side and above the housing edge (top right-hand side on the PCB) upward to STD and, for battery operation, downward to BATT (see also marking on the changer housing).
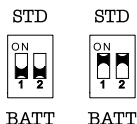
3 Put the coin validator back in and engage.

4 Switch the power off and then on again. The desired operating mode is activated.

8 CLEANING

Only the coin validator must be wiped clean from time to time with a damp cloth (lukewarm water with some washing-up liquid):

⚠️ **Under no circumstances may the cloth be so wet that fluid runs into the device. Otherwise the PCBs will be damaged**
Do not use any solvents or scouring agents which attack the plastic of the device.

1 Pull the vending machine's mains plug.
2 Press lever **1** upwards and open the coin validator (Fig. 8).
3 Use a cloth to wipe off the coin runway inside the coin validator.
4 Press "Close" arrow **2** so that the metal spring engages behind the lever **1** in order to close the coin validator again (Fig. 8).
5 Reconnect the vending machine to the mains supply.
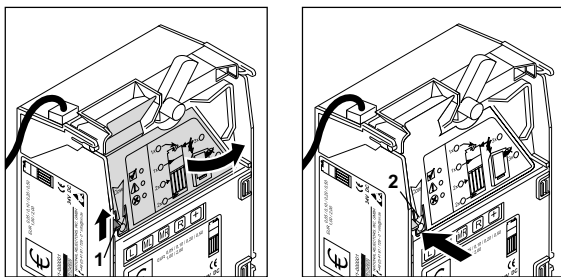
Fig. 8: Opening and closing the coin validator flight deck

9 TRANSPORT

⚠ **Please empty the tube cassette before you transport the changer (see Chap. 7 "Operation"). Coins falling out of the device could otherwise cause damage to the changer's PCB.**

⚠ **Pull the vending machine's mains plug before you remove the changer.**

⚠ **To avoid damages, transport the device in its original packaging only and never by its connecting cables.**

10 TECHNICAL DATA

Supply voltage	10.5 V to 43 V DC
Power consumption	Standby mode: 1.2 VA Max.: 6.0 VA at 24 V DC
Battery operation	Sleep mode: < 5.0 µA Standby mode:< 65.0 mA (Wake-up mode)
Temperature range	-25 °C to +70 °C
Temperature change	Max. 0.2 °C/min.
Humidity	Up to 90 %
Condensation	Not permitted
Machine interface	Serial MDB interface in compliance with MDB/ICP version 3.0, NAMA (optional: USB/RS-232)
Coin acceptance	Max. 16 coin types (of these, up to 3 tokens) in 20 channels Coin diameter: 15–33 mm Coin thickness: 1.2–3.5 mm
Paying out of coins	Max. 4 coin types from a tube cassette (coin diameter and thickness depend on tube cassette in use)
Device dimensions	Height: 380.0 mm Width: 133.5 mm Depth: 76.5 mm (80 mm with pressed return lever)
Mouning position	Vertical, max. deviation: ± 2°
Mark of conformity	CE (see next section), UL (Underwriters Laboratories Inc., independent testing and certification organization, USA), CSA (Canadian standards association)

CE certification

The CE certificate (CE = Communautés Européennes) confirms that our products comply with specified basic requirements of the applicable directive. The CE certificate is not a quality assurance certificate in terms of the quality expected by the manufacturer but only in terms of the quality demanded legally. It is a pure administrative certificate and is intended only as proof of compliance with the directives for the monitoring authorities and not directed at clients or final customers.

Which directives were applied can be seen in the declaration of conformity. The manufacturer must keep this declaration available for the monitoring authorities only (for a minimum period of 10 years after the last product has been introduced to the market). However, upon request we can provide copies of this declaration for our customers.

The following directives and their subsequent changes can be applied to our devices:

1. The EMC Directive (89/336/EEC)
   for devices which cause electromagnetic interference or are interfered with by such.
2. The Low Voltage Directive (73/23/EEC)
   for electrical equipment that is used with a nominal voltage of 50–1000 V AC and 75–1500 V DC.
3. The CE Certificate Labelling Directive (93/68/EEC)
   Modification directive regarding the application and use of CE labels.

Accessories

For all details regarding the changer accessories please refer to our web pages for the product accessories on the internet (www.nri24.com).

11 WHICH FUNCTIONS CAN BE SET USING THE CONFIGURATION TOOLS?

This chapter gives you a list of the device functions you can test and set using the PC programming station WinEMP and using the mobile configuration tools – the Palm OS® application PalmE66/PalmA66 or the setting module.

For further information on all configuration tools please refer to our product accessory pages at www.nri24.com and the appropriate operating instructions.

In addition to the diagnosis of the changer, e.g. in service cases, you can use the configuration tools to change the following settings:

PC programming station WinEMP

- Settings for tube filling process (inhibit cash-box coins, fast coin sorting, automatic tube counter programming)
- Giving change out of the tube cassette
- Resetting the tube counters
- Optimizing the acceptance of genuine coins and the rejection of false coins
- Configuring new coin types and tokens
- Configuring other tube coins
- Configuring the float level
- Configuring maximum number of tube coins
- Configuring the security stock
- Inhibiting individual coin types
- Disabling inventory keys
- Suppressing/activating the automatic tube counter correction
- Configuring individual wake-up time
- Configuring second currency incl. conversion factor (optional)
- Minimizing string manipulation (optional)
- Basic settings (telephone code, smallest coin value with decimal point as a reference value and basis of calculation for all coin values)
- Data block download for current coin information
- Restoring old configuration state of a changer
- Storing the setting of a changer for series configuration

Palm OS® application "PalmE66/PalmA66"

- Settings for tube filling process (inhibit cash-box coins, fast coin sorting, automatic tube counter programming)
- Giving change out of the tube cassette
- Resetting the tube counters
- Configuring up to three tokens
- Configuring other tube coins
- Configuring the float level
- Configuring maximum number of tube coins
- Configuring the security stock
- Inhibiting individual coin types
- Disabling inventory keys
- Suppressing/activating the automatic tube counter correction
- Configuring individual wake-up time
- Configuring communication with external hoppers/recyclers
- Configuring second currency incl. conversion factor (optional)
- Minimizing string manipulation (optional)
- Basic settings (telephone code, smallest coin value with decimal point as a reference value and basis of calculation for all coin values)
- Storing the setting of a changer for series configuration

Setting module

- Settings for tube filling process (inhibit cash-box coins, fast coin sorting, automatic tube counter programming)
- Giving change out of the tube cassette
- Filling/emptying the tube cassette
- Resetting the tube counters
- Configuring up to three tokens
  (only acceptance band, not token type)
- Configuring other tube coins
- Configuring the float level
- Configuring maximum number of tube coins
- Configuring the security stock
- Inhibiting individual coin types
- Disabling inventory keys
- Suppressing/activating the automatic tube counter correction
- Configuring individual wake-up time
- Configuring communication with external hoppers/recyclers
- Minimizing string manipulation (optional)
- Basic settings (telephone code, smallest coin value with decimal point as a reference value and basis of calculation for all coin values)

INDEX

FUNCTION OVERVIEW FOR SETTING MODULE

➡️ If you already know how to use the setting module and only require the memory location of a changer setting, you will find all SER functions and PRO functions and their memory locations in the setting module listed in chronological order in this chapter. For details on how to perform the setting exactly, please refer to the separate instructions for the setting module.

SER functions

Function		Meaning
SER	**01**	**Empty tubes**
	01 01	Left tube
	01 02	Middle left tube
	01 03	Middle right tube
	01 04	Right tube
SER	**05 01**	**Fill tubes**
SER	**06**	**Reset tube counters**
	06 01	Left tube
	06 02	Middle left tube
	06 03	Middle right tube
	06 04	Right tube
SER	**07**	**Teach tokens**
	07 01	Token A in coin channel 14
	07 02	Token B in coin channel 15
	07 03	Token C in coin channel 16

FUNCTION OVERVIEW

PRO functions

Function		Meaning

PRO 04   **Activate (1)/deactivate (0) diverse functions**

04 01   0000**1**1**00**

> Inventory keys disabled, can be enabled by vending machine
>
> Tube security stock can be paid out by vending machines

04 02   **11**0**1**1**1**0**1**

> When filling tubes, only accept coins to be sorted into tubes
>
> Activate float up function
>
> Program tube counters to float levels automatically when filling tubes
>
> Redirect the tube coins to the cash-box after a string manipulation
>
> Transmit the tube filling level including security stock to the vending machine
>
> Disable inventory keys

04 03   **1010**00**11**

> E-66/A-66 terms itself level 2 changer (**1**), not level 3 changer (**0**)
>
> Inhibit high-value banknotes, if "Tube empty" (only if recycler is connected)
>
> Fast coin acceptance without sorting control
>
> Do not correct tube counters automatically

PRO 15   **Inhibit coin channels**
    15 01   Channel 1–8
    15 02   Channel 9–16
    15 03   Channel 17–20

PRO 21 01   **Sensitivity of the string sensor**

PRO 24   **Float level**
    24 01   Left tube
    24 02   Middle left tube
    24 03   Middle right tube
    24 04   Right tube

Function	Meaning
PRO 25	**Maximum number of coins in**
25 01	Left tube
25 02	Middle left tube
25 03	Middle right tube
25 04	Right tube
PRO 26	**Security stock in**
26 01	Left tube
26 02	Middle left tube
26 03	Middle right tube
26 04	Right tube
PRO 50 01	**Smallest coin value**
PRO 52 01	**Telephone code**
PRO 53 01	**Wake-up time**
PRO 54 01	**Sorting into left tube**
PRO 55 01	**Sorting into middle left tube**
PRO 56 01	**Sorting into middle right tube**
PRO 57 01	**Sorting into right tube**
PRO 72	**Coin value for hopper coins/** **Bill value for recycler bills**
72 01	Hopper 1/recycler 1
72 02	Hopper 2/recycler 2
PRO 73 01	01 (Hopper/recycler settings) Communication with hopper(s)/recycler(s) activated

FUNCTION OVERVIEW

TROUBLESHOOTING

If there is a fault on the changer, the pilot lights at the top of the coin validator show where the fault is. In order to diagnose the cause of the fault in detail, the NRI service tools are available (see section "Diagnosis using setting module" in this chapter as well as Chap. 3).

Quick diagnosis using pilot lights

If the green LED at the top lights up or flashes, there are no faults and the device is working properly. If the yellow LED in the middle flashes there is a definite fault which, in general, can be easily remedied. If the red LED at the bottom flashes, it is probably a fault that must be remedied by a service technician.

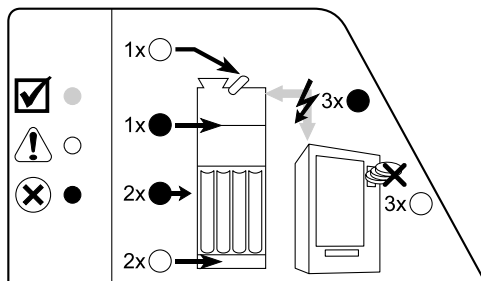The label at the top of the coin validator may help in locating the fault (see Fig. 9).

Fig. 9: Quick diagnosis using pilot lights

LED	Meaning	Troubleshooting
green LED		
lights up	Changer operational	No error
flashes	Tube filling level mode	No error
green and yellow LED		
light up	Coin inserted inhibited from the vending machine	Check vending machine settings (possible that high-value coins are inhibited because tubes are empty)
green and red LED		
light up	Coin inserted inhibited from the changer	Enable coin channel again using switching block or setting module, WinEMP or PalmE66/A66
yellow LED		
flashes once	• Return lever pressed • Switch in coin validator defective	• Check return mechanism in vending machine • Service case
flashes twice	• Coin stuck in payout area • Motor failure	• Remove tube cassette and jammed coin, then pay out one coin from each tube using the inventory keys • Service case
flashes 3 times	Changer inhibited by vending machine	Check vending machine (possibly empty or defective)

TROUBLESHOOTING

LED	Meaning	Troubleshooting
red LED flashes once	Fault in coin validator	• Remove jammed coins from the coin validator by pressing the return lever • Service case, coin validator may have to be exchanged
flashes twice	Fault in changer	Service case, device may have to be exchanged
flashes 3 times	Vending machine no longer communicates with changer (has sent no command in 2 sec.)	Check vending machine control system or connecting cable

Diagnosis using setting module

If there is a fault on the changer, the setting module displays the appropriate status or error message as soon as you connect it to the changer (see Chap. 5 "Installation" and separate instructions for the setting module). Depending on operating mode or fault, three status or fault messages are distinguished:

- INFO messages: used in general only for information about particular operating states
- AN/AB messages: show where a coin was accepted (**AN**)/why a coin was rejected (**AB**)
- FE messages: show why the changer no longer functions

Display	Meaning	Troubleshooting
INFO		
InFo-01	• Return lever pressed • Switch in coin validator defective	• No error • Check return mechanism in vending machine • Service case
InFo-09	String sensor active	• Coin on string recognized (no error) • Check sensor (service case)
InFo-09A	Tube coins are sent to the cash-box after a recognized string manipulation	No error, function can be deactivated in PRO 04 02
InFo-80	Changer inhibited by vending machine	Check vending machine (possibly empty or defective)

TROUBLESHOOTING

Display	Meaning	Troubleshooting
AN		
An **X** YY	Accepted coin is sorted into **X = 0** cash-box **X = 1** left tube **X = 2** middle left tube **X = 3** middle right tube **X = 4** right tube	No error
An X **YY**	Inserted coin accepted in the coin channel **YY = 01–16** (channel no.)	
AB		
Ab-01	Measured values of the inserted coin are outside the acceptance band	If necessary widen acceptance band with WinEMP
Ab-02	Coin inserted inhibited by the changer	Enable coin channel again using switching block or setting module, WinEMP or PalmE66/A66
Ab-03	Inserted coin has not passed through measurement section in the appropriate amount of time	• Remove coins or foreign objects from coin validator by pressing the return lever • Check measurement by air-core coil or CP2 level (service case)
Ab-04	Coins inserted too quickly (two coins in measurement area)	Insert coins again more slowly

Display	Meaning	Troubleshooting
Ab-05	CP3 or CP4 sensor active	• If necessary, eliminate coin jam in the sorting area of the coin validator • Check sensors (service case)
Ab-06	Sensor behind the acceptance gate has not recognized inserted coin (no CP3)	• Check acceptance gate with WinEMP and if necessary, exchange it (service case) • Check CP3 sensor (service case)
Ab-07	Sensor behind the acceptance gate has not recognized inserted coin (no CP4)	• Check acceptance gate with WinEMP and if necessary, exchange it (service case) • Check CP4 sensor (service case)
Ab-08	Inserted coin has covered the sorting control for too long	• If necessary, eliminate coin jam in the sorting area of the coin validator • Check CP4 sensor (service case)
Ab-09	String manipulation recognized	• If necessary, reduce sensitivity of the string sensor in PRO 21 01 • Clean or exchange string sensor (service case) • Check acceptance gate for ease of movement (service case)

TROUBLESHOOTING

Display	Meaning	Troubleshooting
Ab-10	Inserted coin recognized in false money coin channel	No error
Ab-11	Inserted coin recognized as enabling token	No error
Ab-12	Inserted coin inhibited from the vending machine	Check vending machine settings (possible that high-value coins are inhibited because tubes are empty)
Ab-13	Inserted coin not recognized, since light sensors are • effected by external light • defective	• Mount coin validator cover • Exchange light sensors (service case)
Ab-00	Other fault with coin acceptance	Service case
FE		
FE-01	• Coin jammed in the payout area (left tube) • Motor failure (left tube)	• Remove tube cassette and jammed coin, then pay out one coin from that tube using the inventory keys • Service case
FE-02	• Coin jammed in the payout area (middle left tube) • Motor failure (middle left tube)	• Remove tube cassette and jammed coin, then pay out one coin from that tube using the inventory keys • Service case

Display	Meaning	Troubleshooting
FE-03	• Coin jammed in the payout area (middle right tube) • Motor failure (middle right tube)	• Remove tube cassette and jammed coin, then pay out one coin from that tube using the inventory keys • Service case
FE-04	• Coin jammed in the payout area (right tube) • Motor failure (right tube)	• Remove tube cassette and jammed coin, then pay out one coin from that tube using the inventory keys • Service case
FE-05	• Coin jam • CP3 sensor defective	• Eliminate coin jam • Exchange sensor (service case)
FE-06	• Coin jam • CP4 sensor (cash-box) defective	• Eliminate coin jam • Exchange sensor (service case)
FE-07	• Coin jam • Light barrier sensor(s) defective	• Eliminate coin jam • Exchange sensor(s) (service case)
FE-08	Tube filling level sensor(s) are • effected by external light • defective	• Insert tube cassette correctly • Exchange sensor(s) (service case)
FE-13	Checksum fault in acceptance band	Check and, if necessary, adjust the acceptance band of the appropriate coin channel with WinEMP

Display	Meaning	Troubleshooting
FE-14	Checksum fault in coin value range	Check and, if necessary, correct coin values with WinEMP
FE-15	Checksum fault by configuration	Check the PRO functions with the setting module and, if necessary, correct them
FE-35	Hopper/recycler does not respond	Check hopper/recycler or connecting cable or set up communication in PRO 72/73
FE-36	Hopper settings wrong	Check setting in PRO 73 01, probably the communication with hopper/recycler is set up, though there is no interface/device connected
FE-38	Vending machine no longer communicates with changer (has sent no command in 2 sec.)	Check vending machine control system or connecting cable